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(56) Documents cited

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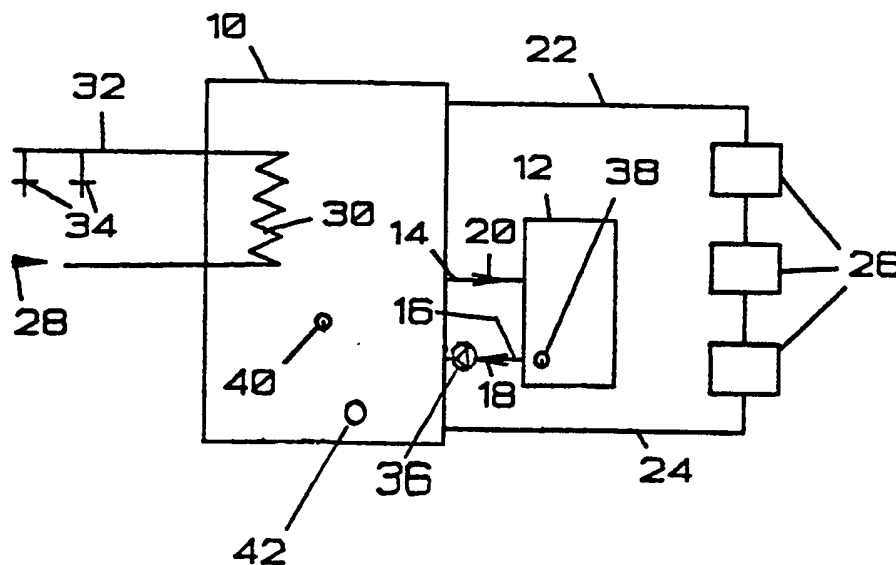
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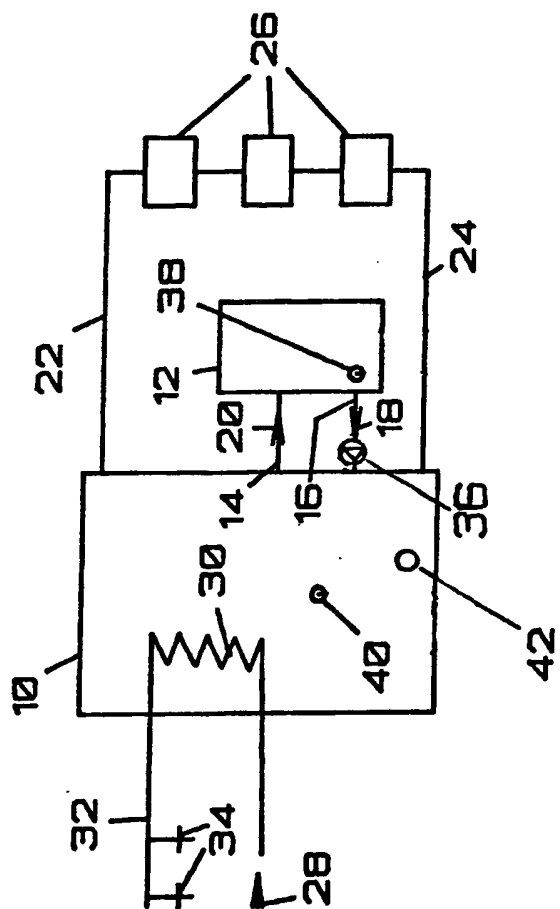
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(54) Indicating state of water storage tank of heating/water heating apparatus

(57) An apparatus for providing domestic hot water comprises a water storage tank 10, and a boiler 12 for heating the water in the tank. The boiler has its own thermostat 38 which switches the boiler and its pump 36 on and off depending upon the temperature of the water issuing from the boiler. The storage tank has its own thermostat 40 which also controls the boiler such that as long as the storage thermostat is satisfied the boiler is switched off. An indicator means such as a neon lamp 42 is provided to indicate to an installer an undesirable situation, not readily noticed when installation is being effected, wherein the boiler switches off without the store thermostat being satisfied; the lamp 42 is extinguished when the store thermostat 40 is satisfied.



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Improvements Relating to Heating/Water Heating Apparatus

This invention relates to heating/water heating apparatus, and in particular concerns heating/water heating apparatus for use especially but not exclusively in a domestic application.

The water heating apparatus to which the invention relates comprises a hot water storage tank, and a boiler for the heating of the water in the storage tank. Typically, the boiler may comprise a gas fired boiler which is connected via suitable circulation pipes with the body of water in the storage tank. Such boilers are provided with thermostatic control means controlling the switching on and off of the boiler as long as there is a demand for hot water from the storage tank. The boiler thermostatic control means operates in that when the temperature of the hot water in the outlet from the boiler reaches a pre-set maximum (boiler stat upper limit) the boiler switches off, and when the temperature of the water in the outlet pipe drops below a pre-set minimum (boiler stat lower limit) the boiler switches until the upper limit is reached.

The demand for hot water is controlled by a storage tank thermostat which is set at a required storage tank temperature which, if the apparatus is properly commissioned and installed, is less than the boiler stat upper limit. If the storage tank temperature is equal to or greater than the required storage tank temperature there is no boiler demand and the boiler and its pump are switched off regardless of the temperature of the water in the boiler outlet, and equally if the store stat temperature is less than the required store temperature, the demand for hot water is present and the boiler will continue to supply hot water, until the demand is satisfied.

In a typical installation, the tank may have a storage capacity of the order of 150 litres. Boiler capacity is only a small fraction of the storage tank capacity.

This arrangement works well as long as the installation of the apparatus has been carried out effectively, and as long as the boiler thermostat and the store thermostat are set to operate at the correct functioning temperatures.

However, what happens in practise is that whilst store thermostats are accurate and reliable, boiler thermostats being relatively inexpensive items are often not set at the correct temperatures, and if the boiler thermostat is set at a temperature which deviates downwardly from the boiler stat upper limit, in the order of four or five degrees, then at least during periods of little draw off of water or heat from the store the boiler thermostat will often be cycling frequently and unnecessarily.

Not only is this inefficient, but if it takes place for example during the night, and if the boiler is located inside a domestic dwelling in which the apparatus is located, then occupants in the dwelling can have their sleep disturbed by virtue of the regular switching on and off of the boiler which, in the case of a gas fired boiler, is quite noisy.

When the apparatus is installed, installers frequently do not perform the installation with sufficient care and attention, and often installers will consider the installation satisfactory if the boiler is working, and is heating the water, and inefficient installation only shows up subsequently when customers complain, for example about the "through the night" noise of the switching on and off of the boiler.

The present invention seeks to provide a simple and effective means for enhancing the installation of heating apparatus, and in accordance with the invention there is provided water heating apparatus comprising a hot water storage tank, a boiler means for heating the water in the storage tank, a storage tank thermostat connected to switch off the boiler when the storage tank thermostat is satisfied and an installation indicator means coupled to the storage tank thermostat, which changes condition when the storage tank thermostat is satisfied.

The indication means preferably is an illumination means such as a neon light which gives the indication in the form of being extinguished when the thermostat is satisfied in the conditions mentioned above.

Thus, when the apparatus is installed, the installer will switch on the apparatus to cause the boiler to heat the water, and the charging procedure continues until the boiler switches off. At this stage, the installer checks the indication means, in particular the neon light, to assess if it has gone out, and if it has then he knows that correct installation has been effected, and that the boiler thermostat is operating at the correct range, and that the store thermostat is satisfied. With the correct installation, during quiescent periods, if the temperature of the water in the store falls, then the store thermostat will control the operation of the boiler which may switch on and off as little as once per evening. This compares with the situation where the boiler thermostat is not operating at the correct rating, and the boiler thermostat controls the maintenance of the temperature of the water during the night, in which case the boiler may switch on and off as many as fifteen to twenty times per hour having regard to the apparatus of the

capacity as indicated herein.

Any other indication means may be used in addition to or as an alternative to the illumination means, and the invention can be applied to other types of boilers or heaters such as electric heaters and boilers.

The invention has particular application to heating apparatus of the type known as "integrated thermal storage" apparatus in which the water in the thermal store is used for supplying heat to space heating devices such as radiators, and the heat may be supplied by passing the water from the thermal store directly through the radiators by means of a suitable circulation pump, or it may be supplied by heat exchange, whilst secondary water for the supply of the taps and other outlets in a domestic application is obtained by passing mains water through a heat exchange coil located in the water of the thermal store.

Our British Patent Specifications Nos. 2,136,099; 2,153,503; 2,153,504 show various examples of thermal storage apparatus and describe particular advantageous features. The present invention can be used with any one or more of the advantageous features disclosed in these patent specifications.

An embodiment of the present invention will now be described, by way of example, with reference to the accompanying diagrammatic drawing, of which the single figure is a diagram illustrating an integrated thermal storage heating apparatus which embodies a gas boiler.

Referring to the drawing, integrated thermal storage heating apparatus comprises a water storage tank 10 having a capacity in the order of 150 litres or more. The water in th tank 10

is heated by means of a gas fired boiler 12 through which the water from the store is circulated by the pump 36 via pipes 14 and 16, the direction of water flow through the pipes 14 and 16 being indicated by arrows 18 and 20.

Water from the store is circulated on demand through circulation pipes 22, 24 of a space heating system of a domestic dwelling and including the radiators 26. The water in the store is the primary water in that it provides the means for space heating, and secondary hot water is provided by circulating cold water from the mains 28 through a heat exchange coil 30 contained in the storage tank 10 and delivering the mains water now heated through an outlet pipe 32 to tap outlets 34.

The boiler 12 is under the control of two thermostats namely a boiler thermostat 38 which is positioned to sense the temperature of the water being discharged from the boiler outlet back to the thermal store, and a store thermostat 40 which is located in the water of the thermal store at the position shown.

If the apparatus is correctly installed, and the boiler thermostat is operating at the rated boiler stat upper and lower limit temperatures, then during periods when there is little or no heat removal from the thermal store either by the space heating circuit or by the supply of secondary hot water, such as during the night, the control of the boiler should be under the store thermostat, and as the store temperature will drop only very slowly, this means that the boiler will switch on and off only infrequently during such periods e.g. of the order of once per night. However, if the boiler thermostat is not operating correctly at the rated temperature range, and in particular is operating below the rated upper limit temperature, the store thermostat may never

be satisfied and the boiler may be switching on and off continuously to maintain a supply of hot water. This may not be noticeable during the day especially if there is a high draw off of hot water, but during the night when there is little or no draw off the boiler may well switch on and off as many as fifteen to twenty times per hour. This causes inefficiency, and more particularly if the boiler is located inside the house, causes annoyance as the noisy switching on and off of the gas boiler can wake up the occupants.

The present invention and in particular the present embodiment provides a simple and effective means for checking the installation of the apparatus to ensure that this undesirable result does not take place. The means for achieving this is the provision of an indication means, in this example a neon light 42 which is electrically connected so as to be controlled by at least the store thermostat such that when the store thermostat is satisfied, and electrically this is indicated, a switch means in the circuit is also operated and the neon light is extinguished. The installation procedure is to install the apparatus and switch on the boiler to heat up the water in the store. When the boiler eventually switches off, the installer should check to see if at that time the neon light 42 is extinguished and if it is the installer knows that the store stat is properly controlling the demand and installation has been effected correctly. The boiler stat upper limit temperature is greater than that of the store thermostat. If, when the boiler switches off during this installation procedure, the neon light is still illuminated, then the installer knows immediately that the installation is ineffective and can take the appropriate remedial action by adjusting or replacing the boiler thermostat.

The store therm stat will be wired appropriately to the neon

light to enable this effect to be achieved.

Any other form of indication means may be used either in addition to or as an alternative to the neon light 42, and such means may be audio and/or visual. A visual indication is preferred, because as the initial charging procedure can take some time e.g. in the order of two hours, and as the installer may be remotely located when charging has been completed, an unattended audio signal may create a nuisance.

The invention provides a simple and effective means for enhancing the installation procedure and indeed for enhancing the subsequent running of the apparatus, because if the boiler thermostat upper limit temperature drifts downwards, then although installation has been effected correctly, the continued illumination of the neon light during operation of the equipment may indicate that the boiler thermostat needs attention, especially if the light remains on during quiet periods e.g. during the night, and if the boiler starts to switch on and off frequently during such periods.

CLAIMS

1. Heating/water heating apparatus comprising a hot water storage tank, a boiler means for heating the water in the storage tank, a storage tank thermostat connected to switch off the boiler when the storage tank thermostat is satisfied and an installation indicator means coupled to the storage tank thermostat, which changes condition when the storage tank thermostat is satisfied.
2. Heating/water heating apparatus according to Claim 1, wherein the installation indicator means comprises an indicator lamp which is extinguished when the store thermostat is satisfied.
3. Heating/water heating apparatus according to Claim 1, wherein the indicator lamp is a neon lamp.
4. Heating/water heating apparatus substantially as hereinbefore described with reference to the accompanying drawing.